

AMENDMENT UNDER 37 C.F.R. § 1.116
U.S. Application No. 09/639,992
Attorney Docket No. Q60457

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1-4. (canceled).

5. (currently amended): An image processing apparatus ~~in accordance with Claim 1~~
comprising

image data storing means for storing digital image data obtained by photoelectrically detecting light with a CCD to produce analog image data and digitizing the analog pixel data,

memory means for two-dimensionally mapping and storing the digital image data stored in the image data storing means, and

abnormal pixel determining means for specifying each pixel in the digital image data stored in the memory means as a subject pixel, reading density signal level of the subject pixel together with density signal levels of pixels adjacent to the subject pixel, comparing the density signal level of the subject pixel with the density signal levels of pixels adjacent to the subject pixel and defining the subject pixel as an abnormal pixel when difference between the density signal level of the subject pixel and the density signal levels of pixels adjacent to the subject pixel is greater than a predetermined level,

wherein the abnormal pixel determining means is constituted so as to calculate an average value A, the maximum value MAX and the minimum value MIN of the density signal levels of pixels adjacent to each subject pixel and judge that the difference between the density signal level of the subject pixel and the density signal levels of the pixels adjacent to the subject pixel is greater than the predetermined level when the density signal level x of the subject pixel satisfies:

$$x > A + (MAX-MIN) * n, \text{ or}$$

$$x < A - (MAX-MIN) * n$$

wherein n is a positive constant.

6. (currently amended): An image processing apparatus ~~in accordance with Claim 2~~
comprising:

image data storing means for storing digital image data obtained by photoelectrically detecting light with a CCD to produce analog image data and digitizing the analog pixel data,

memory means for two-dimensionally mapping and storing the digital image data stored in the image data storing means,

abnormal pixel determining means for specifying each pixel in the digital image data stored in the memory means as a subject pixel, reading density signal level of the subject pixel together with density signal levels of pixels adjacent to the subject pixel, comparing the density signal level of the subject pixel with the density signal levels of pixels adjacent to the subject

pixel and defining the subject pixel as an abnormal pixel when difference between the density signal level of the subject pixel and the density signal levels of pixels adjacent to the subject pixel is greater than a predetermined level, and

abnormal pixel correcting means for correcting the density signal level of each subject pixel in accordance with the density signal levels of the pixels adjacent to the subject pixel when the subject pixel is defined as an abnormal pixel by the abnormal pixel determining means,

wherein the abnormal pixel determining means is constituted so as to calculate an average value A, the maximum value MAX and the minimum value MIN of the density signal levels of pixels adjacent to each subject pixel and judge that the difference between the density signal level of the subject pixel and the density signal levels of the pixels adjacent to the subject pixel is greater than the predetermined level when the density signal level x of the subject pixel satisfies:

$$x > A + (MAX-MIN) * n, \text{ or}$$

$$x < A - (MAX-MIN) * n$$

wherein n is a positive constant.

7. (currently amended): An image processing apparatus ~~in accordance with Claim 3~~
comprising

image data storing means for storing digital image data obtained by photoelectrically detecting light with a CCD to produce analog image data and digitizing the analog pixel data,

memory means for two-dimensionally mapping and storing the digital image data stored in the image data storing means, and

abnormal pixel determining means for specifying each pixel in the digital image data stored in the memory means as a subject pixel, reading density signal level of the subject pixel together with density signal levels of pixels adjacent to the subject pixel, comparing the density signal level of the subject pixel with the density signal levels of pixels adjacent to the subject pixel and defining the subject pixel as an abnormal pixel when difference between the density signal level of the subject pixel and the density signal levels of pixels adjacent to the subject pixel is greater than a predetermined level,

wherein the abnormal pixel determining means is constituted so as to determine whether the density signal level of each subject pixel is higher than a maximum value of the density signal levels of the pixels adjacent to the subject pixel and whether or not the density signal level of the subject pixel is lower than a minimum value of the density signal levels of the pixels adjacent to the subject pixel, and judge whether or not the difference between the density signal level of the subject pixel and the density signal levels of pixels adjacent to the subject pixel is greater than the predetermined level when the density signal level of the subject pixel is higher than the maximum value of the density signal levels of the pixels adjacent to the subject pixel or when the density signal level of the subject pixel is lower than the minimum value of the density signal levels of the pixels adjacent to the subject pixel, and

wherein the abnormal pixel determining means is constituted so as to calculate an average value A, the maximum value MAX and the minimum value MIN of the density signal

levels of pixels adjacent to each subject pixel and judge that the difference between the density signal level of the subject pixel and the density signal levels of the pixels adjacent to the subject pixel is greater than the predetermined level when the density signal level x of the subject pixel satisfies:

$$x > A + (\text{MAX-MIN}) * n, \text{ or}$$

$$x < A - (\text{MAX-MIN}) * n$$

wherein n is a positive constant.

8. (previously presented): An image processing apparatus ~~in accordance with Claim 4~~
comprising

image data storing means for storing digital image data obtained by photoelectrically detecting light with a CCD to produce analog image data and digitizing the analog pixel data,

memory means for two-dimensionally mapping and storing the digital image data stored in the image data storing means,

abnormal pixel determining means for specifying each pixel in the digital image data stored in the memory means as a subject pixel, reading density signal level of the subject pixel together with density signal levels of pixels adjacent to the subject pixel, comparing the density signal level of the subject pixel with the density signal levels of pixels adjacent to the subject pixel and defining the subject pixel as an abnormal pixel when difference between the density

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signal level of the subject pixel and the density signal levels of pixels adjacent to the subject pixel is greater than a predetermined level, and

abnormal pixel correcting means for correcting the density signal level of each subject pixel in accordance with the density signal levels of the pixels adjacent to the subject pixel when the subject pixel is defined as an abnormal pixel by the abnormal pixel determining means,

wherein the abnormal pixel determining means is constituted so as to determine whether the density signal level of each subject pixel is higher than a maximum value of the density signal levels of the pixels adjacent to the subject pixel and whether or not the density signal level of the subject pixel is lower than a minimum value of the density signal levels of the pixels adjacent to the subject pixel, and judge whether or not the difference between the density signal level of the subject pixel and the density signal levels of pixels adjacent to the subject pixel is greater than the predetermined level when the density signal level of the subject pixel is higher than the maximum value of the density signal levels of the pixels adjacent to the subject pixel or when the density signal level of the subject pixel is lower than the minimum value of the density signal levels of the pixels adjacent to the subject pixel, and

wherein the abnormal pixel determining means is constituted so as to calculate an average value A, the maximum value MAX and the minimum value MIN of the density signal levels of pixels adjacent to each subject pixel and judge that the difference between the density signal level of the subject pixel and the density signal levels of the pixels adjacent to the subject pixel is greater than the predetermined level when the density signal level x of the subject pixel satisfies:

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$$x > A + (\text{MAX-MIN}) * n, \text{ or}$$

$$x < A - (\text{MAX-MIN}) * n$$

wherein n is a positive constant.

9. (original): An image processing apparatus in accordance with Claim 5 wherein the positive constant n is set between 1 and 2.

10. (original): An image processing apparatus in accordance with Claim 6 wherein the positive constant n is set between 1 and 2.

11. (original): An image processing apparatus in accordance with Claim 7 wherein the positive constant n is set between 1 and 2.

12. (original): An image processing apparatus in accordance with Claim 8 wherein the positive constant n is set between 1 and 2.

13-15. (canceled).

16. (original): An image processing apparatus in accordance with Claim 5 wherein the abnormal pixel correcting means is constituted so as to correct the density signal level of each subject pixel in such a manner that the corrected density signal level is equal to an average value of the density signal levels of the pixels adjacent to the subject pixel excluding the pixels whose density signal levels have the maximum value and the minimum value.

17. (original): An image processing apparatus in accordance with Claim 6 wherein the abnormal pixel correcting means is constituted so as to correct the density signal level of each subject pixel in such a manner that the corrected density signal level is equal to an average value of the density signal levels of the pixels adjacent to the subject pixel excluding the pixels whose density signal levels have the maximum value and the minimum value.

18. (original): An image processing apparatus in accordance with Claim 7 wherein the abnormal pixel correcting means is constituted so as to correct the density signal level of each subject pixel in such a manner that the corrected density signal level is equal to an average value of the density signal levels of the pixels adjacent to the subject pixel excluding the pixels whose density signal levels have the maximum value and the minimum value.

19. (original): An image processing apparatus in accordance with Claim 8 wherein the abnormal pixel correcting means is constituted so as to correct the density signal level of each

subject pixel in such a manner that the corrected density signal level is equal to an average value of the density signal levels of the pixels adjacent to the subject pixel excluding the pixels whose density signal levels have the maximum value and the minimum value.

20-23. (canceled).

24. (original): An image processing apparatus in accordance with Claim 5 wherein the pixels adjacent to the subject pixel are the group of pixels obtained by excluding the subject pixel from $3 * 3$ pixels including the subject pixel as a center pixel.

25. (original): An image processing apparatus in accordance with Claim 6 wherein the pixels adjacent to the subject pixel are the group of pixels obtained by excluding the subject pixel from $3 * 3$ pixels including the subject pixel as a center pixel.

26. (original): An image processing apparatus in accordance with Claim 7 wherein the pixels adjacent to the subject pixel are the group of pixels obtained by excluding the subject pixel from $3 * 3$ pixels including the subject pixel as a center pixel.

27. (original): An image processing apparatus in accordance with Claim 8 wherein the pixels adjacent to the subject pixel are the group of pixels obtained by excluding the subject pixel from $3 * 3$ pixels including the subject pixel as a center pixel.

28-30. (canceled).

31. (original): An image processing apparatus in accordance with Claim 16 wherein the pixels adjacent to the subject pixel are the group of pixels obtained by excluding the subject pixel from $3 * 3$ pixels including the subject pixel as a center pixel.

32. (original): An image processing apparatus in accordance with Claim 17 wherein the pixels adjacent to the subject pixel are the group of pixels obtained by excluding the subject pixel from $3 * 3$ pixels including the subject pixel as a center pixel.

33. (original): An image processing apparatus in accordance with Claim 18 wherein the pixels adjacent to the subject pixel are the group of pixels obtained by excluding the subject pixel from $3 * 3$ pixels including the subject pixel as a center pixel.

34. (original): An image processing apparatus in accordance with Claim 19 wherein the pixels adjacent to the subject pixel are the group of pixels obtained by excluding the subject pixel from $3 * 3$ pixels including the subject pixel as a center pixel.

35-37. (canceled).

38. (currently amended): An image processing apparatus ~~in accordance with claim 37~~
comprising

image data storing means for storing digital image data obtained by photoelectrically detecting light with a CCD to produce analog image data and digitizing the analog pixel data,

memory means for two-dimensionally mapping and storing the digital image data stored in the image data storing means, and

abnormal pixel determining means for specifying each pixel in the digital image data stored in the memory means as a subject pixel, reading density signal level of the subject pixel together with density signal levels of pixels adjacent to the subject pixel, comparing the density signal level of the subject pixel with the density signal levels of pixels adjacent to the subject pixel and defining the subject pixel as an abnormal pixel when difference between the density signal level of the subject pixel and the density signal levels of pixels adjacent to the subject pixel is greater than a predetermined level,

wherein the abnormal pixel determining means is constituted so as to compare the density signal level of the subject pixel with a threshold, wherein the threshold is a deviation from an average of density signal levels of pixels adjacent to the subject pixel, and

wherein the deviation is a factor of the range of density signal levels of the adjacent pixels.

39. (currently amended): An image processing apparatus ~~in accordance with claim 1~~ comprising

image data storing means for storing digital image data obtained by photoelectrically detecting light with a CCD to produce analog image data and digitizing the analog pixel data,

memory means for two-dimensionally mapping and storing the digital image data stored in the image data storing means, and

abnormal pixel determining means for specifying each pixel in the digital image data stored in the memory means as a subject pixel, reading density signal level of the subject pixel together with density signal levels of pixels adjacent to the subject pixel, comparing the density signal level of the subject pixel with the density signal levels of pixels adjacent to the subject pixel and defining the subject pixel as an abnormal pixel when difference between the density signal level of the subject pixel and the density signal levels of pixels adjacent to the subject pixel is greater than a predetermined level,

wherein the subject pixel is defined as an abnormal pixel when the density signal level of the subject pixel is not within a range of deviation from a mean of adjacent pixel values, wherein the range of deviation is a factor of the difference between a maximum value of the density signal levels of the adjacent pixels and a minimum value of the density signal levels of the adjacent pixels.

40-44. (canceled).

45. (currently amended): ~~The method of claim 43~~ An image processing method,
comprising:

photoelectrically detecting light with a CCD to produce analog image data;

digitizing the analog image data;

two-dimensionally mapping the digitized image data;

specifying a subject pixel from the mapped image data;

reading a density signal level of the subject pixel together with density signal levels of
pixels adjacent to the subject pixel;

comparing the density signal level of the subject pixel with the density signal levels of
pixels adjacent to the subject pixel; and

defining the subject pixel as an abnormal pixel when a difference between the density signal level of the subject pixel and the density signal levels of pixels adjacent to the subject pixel is greater than a predetermined level,

wherein said comparing comprises comparing the density signal level of the subject pixel with a threshold, wherein said threshold is a deviation from an average of density signal levels of pixels adjacent to the subject pixel, and

wherein said deviation is a factor of the range of density signal levels of the adjacent pixels.

46. (currently amended): ~~The method of claim 41~~ An image processing method,
comprising:

photoelectrically detecting light with a CCD to produce analog image data;

digitizing the analog image data;

two-dimensionally mapping the digitized image data;

specifying a subject pixel from the mapped image data;

reading a density signal level of the subject pixel together with density signal levels of pixels adjacent to the subject pixel;

comparing the density signal level of the subject pixel with the density signal levels of pixels adjacent to the subject pixel; and

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defining the subject pixel as an abnormal pixel when a difference between the density signal level of the subject pixel and the density signal levels of pixels adjacent to the subject pixel is greater than a predetermined level,

wherein the subject pixel is defined as an abnormal pixel when the density signal level of the subject pixel is not within a range of deviation from a mean of adjacent pixel values, wherein the range of deviation is a factor of the difference between a maximum value of the density signal levels of the adjacent pixels and a minimum value of the density signal levels of the adjacent pixels.

47. (currently amended): ~~The method of claim 41~~ An image processing method,
comprising:

photoelectrically detecting light with a CCD to produce analog image data;
digitizing the analog image data;
two-dimensionally mapping the digitized image data;
specifying a subject pixel from the mapped image data;
reading a density signal level of the subject pixel together with density signal levels of pixels adjacent to the subject pixel;
comparing the density signal level of the subject pixel with the density signal levels of pixels adjacent to the subject pixel; and

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defining the subject pixel as an abnormal pixel when a difference between the density signal level of the subject pixel and the density signal levels of pixels adjacent to the subject pixel is greater than a predetermined level,

wherein said comparing further comprises calculating an average value A, the maximum value MAX and the minimum value MIN of the density signal levels of pixels adjacent to each subject pixel and judge that the difference between the density signal level of the subject pixel and the density signal levels of the pixels adjacent to the subject pixel is greater than the predetermined level when the density signal level x of the subject pixel satisfies:

$$x > A + (\text{MAX} - \text{MIN}) * n, \text{ or}$$

$$x < A - (\text{MAX} - \text{MIN}) * n$$

wherein n is a positive constant.

48. (canceled).